

Appendix C – Glossary of Terms

Alpha (α) is the predetermined threshold of statistical significance in null-hypothesis testing. This threshold is frequently set at 0.01, 0.05, or 0.1. *P*-values less than alpha suggest a phenomenon that would rarely occur by chance alone (e.g., a strong trend, relationship between variables, or difference between groups); tests with *P*-values greater than alpha are deemed ‘non-significant.’

a priori – Beforehand; when referring to power analyses, this refers to analyses conducted prior to sampling that use existing data to obtain estimates of variability in the monitored component to either estimate sample sizes needed to detect a desired level of change or determine what amount of change can be detected with a particular sample size (see ‘Power,’ below).

Attributes are any living or nonliving feature or process of the environment that can be measured or estimated and that provide insights into the state of the ecosystem.

Drivers are major external driving forces such as climate, fire cycles, biological invasions, hydrologic cycles, and natural disturbance events (e.g., earthquakes, droughts, floods) that have large scale influences on natural systems.

Ecological integrity is a concept that expresses the degree to which the physical, chemical, and biological components (including composition, structure, and process) of an ecosystem and their relationships are present, functioning, and capable of self-renewal. Ecological integrity implies the presence of appropriate species, populations, and communities and the occurrence of ecological processes at appropriate rates and scales as well as the environmental conditions that support these taxa and processes.

Ecosystem is defined as, "a spatially explicit unit of the Earth that includes all of the organisms, along with all components of the abiotic environment within its boundaries".

Focal resources are park resources that, by virtue of their special protection, public appeal, or other management significance, have paramount importance for monitoring regardless of current threats or whether they would be monitored as an indication of ecosystem integrity. Focal resources might include ecological processes such as deposition rates of nitrates and sulfates in certain parks, or they may be a species that is harvested, endemic, alien, or has protected status.

Index site is a site selected for sampling because it is of particular interest.

Indicators are a subset of monitoring attributes that are particularly information-rich in the sense that their values are somehow indicative of the quality, health, or integrity of the larger ecological system to which they belong. Indicators are a selected subset of the physical, chemical, and biological elements and processes of natural systems that are selected to represent the overall health or condition of the system (see also Vital Sign below).

Measures are the specific feature(s) used to quantify an indicator, as specified in a sampling protocol.

Power – The probability that a test will reject a false null hypothesis, or in other words that it will not make a Type II error. Power increases as sample size or effect size (e.g., magnitude of change) increases, variability in the indicator decreases, and as alpha is relaxed (= increased).

Power analysis – A calculation performed to estimate sample sizes needed to detect a desired level of change or determine what amount of change can be detected with a particular sample size. Power is a function of sample size, sample variance, effect size, and alpha; consequently, if any four of these variables are known (or chosen), the fifth can be calculated.

Probabilistic design – A sampling design in which all potential points within the sampling domain have a known probability of being selected for sampling. Selection occurs via some process that randomly selects points.

Sample panel – A group of sample units visited at the same recurring interval. Sampling units (e.g., sites) from the entire population may be subdivided into several panels, each of which may be sampled more or less frequently, depending on the re-visit strategy.

Sampling domain – The area in which samples occur. If sampling locations are randomly selected and have reasonable replication, this corresponds to the area about which inferences can be drawn.

Stressors are physical, chemical, or biological perturbations to a system that are either (a) foreign to that system or (b) natural to the system but applied at an excessive (or deficient) level. Stressors cause significant changes in the ecological components, patterns, and processes in natural systems. Examples include water withdrawal, pesticide use, timber harvesting, traffic emissions, stream acidification, trampling, poaching, land-use change, and air pollution.

Simple random sampling – A sampling strategy whereby the total number of sites is selected from the sampling domain such that every point has the same probability of being selected. The procedure for selecting units must be truly random.

Stratified random sampling – A sampling strategy in which the sampling domain is divided into mutually exclusive and exhaustive subpopulations called strata, each of which is clearly defined. Each sampling unit is subsequently classified into the appropriate stratum, and then a simple random sample is drawn from each stratum.

Systematic sampling – a sampling algorithm in which the first sampling unit is randomly selected and subsequent units are selected according to a regular (i.e., systematic) pattern (e.g., every *i*th grid cell) (Mendenhall et al. 1971)

Type I error – Incorrectly rejecting a null hypothesis that is actually true. For example, it is stated that a trend is detected when, in fact, none exists. When expressed as a probability, it can be symbolized by alpha (α); when expressed as a percentage, it is known as significance level.

Type II error – Failing to reject a false null hypothesis. For example, concluding that no trend (or no trend of a particular magnitude) has occurred, although one actually has.

Vital Signs, as used by the National Park Service, are a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values. The elements and processes that are monitored are a subset of the total suite of natural resources that park managers are directed to preserve "unimpaired for future generations," including water, air, geological resources, plants and animals, and the various ecological, biological, and physical processes that act on those resources. Vital signs may occur at any level of organization including landscape, community, population, or genetic level, and may be compositional (referring to the variety of elements in the system), structural (referring to the organization or pattern of the system), or functional (referring to ecological processes).